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(54) **BURIED FIELD RING FIELD EFFECT TRANSISTOR (BUF-FET) INTEGRATED WITH CELLS IMPLANTED WITH HOLE SUPPLY PATH**

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(57) **ABSTRACT**

This invention discloses a semiconductor power device formed in a semiconductor substrate comprises a highly doped region near a top surface of the semiconductor substrate on top of a lightly doped region. The semiconductor power device further comprises a body region, a source region and a gate disposed near the top surface of the semiconductor substrate and a drain disposed at a bottom surface of the semiconductor substrate. The semiconductor power device further comprises source trenches opened into the highly doped region filled with a conductive trench filling material in electrical contact with the source region near the top surface. The semiconductor power device further comprises a buried field ring regions disposed below the source trenches and doped with dopants of opposite conductivity from the highly doped region. In an alternate embodiment, the semiconductor power device further comprises doped regions surrounded the sidewalls of the source trenches and doped with a dopant of a same conductivity type of the buried field ring regions to function as a charge supply path.